Enclosure 7

Weber & Heim

Deutsche Patentanwälte
European Patent Attorneys
Euro Trademark Attorneys

Irmgardstrasse 3
D-81479 München
Tel. 089-79 90 47
Fax 089-791 52 56

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NEW CLAIMS

1. Fluorescence microscope, particularly confocal fluorescence laser microscope,
having a radiation source (L1, L2, L3), particularly a laser emitting excitation light for a sample,
with a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,
having a microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,
having an acousto-optical element (AOM, AOTF) for diffracting excitation light and with which it is possible to regulate an intensity of the diffracted excitation light, being positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1),
   - the emission light emitted by the sample having fractions of excitation light and fractions of wavelength-shifted fluorescence light,
   - excitation light emitted by the sample can be deflected in the direction of the radiation source by the acousto-optical device (AOM, AOTF),
   - and wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light and

- in which the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element such that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical element (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT) and

having a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is located between the acousto-optical element and the detection device (DE, DT, NFT).

2. Fluorescence microscope according to claim 1, characterized in
that at least one optical element influencing the light direction is provided in an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF) for the improved separation of the light fractions.

3. Fluorescence microscope according to claim 2, characterized in
that as the optical element is provided a reflection element (S1, S2, PS, S), particularly a mirror (S), a bimirror (S1, S2) or a vapourized prism (PS).

4. Fluorescence microscope according to one of the claims 2 or 3,
characterized in
that as the optical element or as a further optical element is provided a light refracting element (P), particularly an unvapourized prism (P), which is located in an excitation

beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF).

5. Fluorescence microscope, particularly confocal fluorescence laser microscope,
having a radiation source (L1, L2, L3), particularly a laser, which emits excitation light for a sample,
having a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,
having a microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,
having an acousto-optical element (AOM, AOTF) for diffracting excitation light and which is positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1),
- the emission light emitted by the sample having fractions of excitation light and fractions of wavelength-shifted fluorescence light,
- excitation light emitted by the sample can be deflected in the direction of the radiation source by diffraction by the acousto-optical device (AOM, AOTF),
- and wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF)
and is spatially separable from excitation light fractions of the emission light and
- in which the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element that wavelength-shifted fluorescence light

transmitted undiffracted through the acousto-optical element (AOM, AOTF) can be detected by means of the detection device (DE, DT, NFT),

having a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical element and the detection device (DE, DT, NFT), and

with at least one light reflecting element (P), particularly an unvapourized prism (P), for influencing the light direction and for separating the light fractions and which is located in an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF).

6. Fluorescence microscope according to one of the claims 1 to 5,

characterized in

that in the direction of the microscope optics (SC1, SC2, SCO, M1) as acousto-optical elements (AOM, AOTF) are firstly provided AOM and then AOTF.

7. Fluorescence microscope, particularly confocal fluorescence laser microscope,

having a radiation source (L1, L2, L3), particularly a laser, which emits excitation light for a sample,

having a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,

having a microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

having a plurality of acousto-optical elements (AOM, AOTF) for diffracting excitation light, which are so positioned between the radiation source and the microscope optics that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1),

- in which in the direction of the microscope optics (SC1, SC2, SCO, M1) as acousto-optical elements (AOM, AOTF) are firstly provided AOM and then AOTF,
- the emission light emitted by the sample having fractions of excitation light and fractions of wavelength-shifted fluorescence light,
- excitation light emitted by the sample is deflectable by diffraction in the direction of the radiation source by the acousto-optical devices (AOM, AOTF),
- and wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical elements (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light and
- in which the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical elements that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical elements (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT) and
- with a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical elements and the detection device (DE, DT, NFT).

8. Fluorescence microscope according to one of the claims 1 to 7,

characterized in
that at least one glass fibre is provided for feeding in excitation light.

9. Fluorescence microscope according to one of the claims 7 or 8,
characterized in
that at least one optical element influencing the light direction is provided in an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF) to bring about improved separation of the light fractions.

10. Fluorescence microscope according to one of the claims 1 to 9,
characterized in that
- the radiation source (L1, L2, L3) is constructed as a plurality of lasers (L1, L2, L3) having a different wavelength,
- a plurality of acousto-optical elements (AOM, AOTF) is provided and with each laser (L1, L2, L3) is associated at least one acousto-optical element (AOM, AOTF),
- the different wavelengths by diffraction in the acousto-optical elements (AOM, AOTF) can be simultaneously or individually fed into a microscope beam path (SC1, SC2, SCO, M1), and
- wavelength-shifted emission light and excitation light having in each case a different wavelength can be transmitted undiffracted through the respective acousto-optical elements (AOM, AOTF).

11. Fluorescence microscope according to one of the claims 1 to 10, characterized in that as acousto-optical elements AOTF and/or AOM are provided.

12. Fluorescence microscope according to claim 10, characterized in that the excitation power of each laser (L1, L2, L3) is independently adjustable with the respective acousto-optical element (AOM, AOTF).

13. Fluorescence microscope according to one of the claims 1 to 12, characterized in that the acousto-optical elements (AOM, AOTF) by a frequency change can be switched from a first wavelength of a first laser to a second wavelength of a second laser.

14. Fluorescence microscope according to one of the claims 1 to 13, characterized in that the excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1) by diffraction at the acousto-optical element (AOM, AOTF) in the first diffraction order.

15. Fluorescence microscope according to one of the claims 1 to 14, characterized in that a pinhole (PH) as the excitation and detection pinhole is located upstream of the microscope optics (SC1, SC2, SCO, M1).

16. Fluorescence microscope according to one of the claims 10 to 15,
characterized in
that the radiation of the plurality of lasers (L1, L2, L3) in the direction of the microscope optics (SC1, SC2, SCO, M1) can be successively fed into the microscope beam path in a sequence based on decreasing wavelength.

17. Fluorescence microscope according to one of the claims 1 to 16,
characterized in
that UV light, visible light and/or infrared light can be fed into the microscope beam path.

18. Device for feeding light into a beam path of a microscope, particularly a confocal fluorescence laser microscope, having a plurality of light sources (L1, L2, L3), which emit light of different wavelengths,
characterized in
that a plurality of light diffracting elements, particularly acousto-optical elements (AOM, AOTF) is provided,
that with each light source (L1, L2, L3) is associated at least one light diffracting element,
that for combining the light of the plurality of light sources (L1, L2, L3) the light diffracting elements are located on a common optical axis and
that the different wavelengths by diffraction in the light diffracting elements can be simultaneously or individually fed into the common optical axis and are combinable in the common optical axis.

19. Device according to claim 18,
characterized in
that AOTF or AOM are provided as light diffracting elements.

20. Device according to claim 19,
characterized in
that as acousto-optical elements (AOM, AOTF) firstly AOM and then AOTF are provided in the direction of the microscope optics (SC1, SC2, SCO, M1).